AMENDED CLAIMS

[received by the International Bureau on 21 December 2005 (21.12.05);
Claims 179, 180, 184, 186, 191, 195 to 197, 201, 205, 214, 222, 225, 231, 233, 237, 239 to 246, 249 to 250, 269, 275, 280 to 283, 285 to 287, 289, 293, 297, 298, 303 to 306, 309, 314 to 321, 323 to 328 and 337 amended;
(43 pages)]

1. A method of separating components of a fluid mixture, comprising the steps of:

providing a fluid mixture comprising a first component and a second component;

providing a sorbent structure comprising at least one sorbent;

sorbing said first component onto said sorbent;

desorbing said first component; and

electrokinetically biasing said first component in a direction other than the vector of said fluid mixture.

2. A method according to claim 1,

wherein said sorbent is an adsorbent.

3. A method according to claim 1,

wherein said sorbent is an absorbent.

4. A method according to claim 1,

wherein

$$\frac{\text{sorption sites per cubic centimeter}}{\begin{array}{c}\text{moles of said first component separated}\\ \text{from said mixture per second}\end{array}}$$

is less than about 6.1×10^{22}.

5. A method according to claim 4,

wherein said

$$\frac{\text{sorption sites per cubic centimeter}}{\begin{array}{c}\text{moles of said first component separated}\\ \text{from said mixture per second}\end{array}}$$

is less than about 6.1×10^{20}.

6. A method according to claim 1,

wherein said desorbing step and said electrokinetically biasing step occur substantially simultaneously.

7. A method according to claim 1,

wherein said desorbing step or said electrokinetically biasing step is effected by applying to said sorbent structure at least one of a dynamic electric field, static non-homogeneous electric field, quasi-static electric field, electromagnetic energy, vibrational energy from a piezoelectric material, electrical conduction, ion bombardment, electron bombardment, or a combination thereof.

8. A method according to claim 7,

wherein said desorbing step and said electrokinetically biasing step are effected by a dynamic electric field.

9. A method according to claim 1, further comprising the step of:

collecting said desorbed first component.

10. A method according to claim 1, further comprising the step of:

collecting an exhaust fluid stream enriched in said second component and depleted in said first component.

11. A method according to claim 1, further comprising the step of:

collecting a heat of sorption generated by said adsorbing step.

12. A method according to claim 7,

wherein said dynamic electric field ionizes at least a portion of said first component to form an ionized first component.

13. A method according to claim 7,

wherein said dynamic electric field polarizes at least a portion of said first component to form a polarized first component.

14. A method according to claim 1,

wherein said desorbing step is substantially non-thermal.

15. A method according to claim 7,

wherein said dynamic electric field produces a non-thermal plasma.

16. A method according to claim 1, further comprising the step of:

generating a plasma.

17. A method according to claim 16,

wherein said plasma is a substantially non-thermal plasma.

18. A method according to claim 1,

wherein said desorbing step comprises an induced electron transition.

19. A method according to claim 1,

wherein said first component is electrokinetically biased in a direction substantially perpendicular to the vector of said fluid mixture. sorbent

20. A method according to claim 1,

wherein eddy or hysterisis currents heat a material adjacent to said sorbent.

21. A method according to claim 7,

wherein said dynamic electric field is produced by a traveling electric field, a traveling electric wave, an electric field flux, a voltage spike, a multiphase electromotive potential, traveling electrostatic wave, or a combination thereof.

22. A method according to claim 21,

wherein said dynamic electric field is continuous.

23. A method according to claim 21,

wherein said dynamic electric field is intermittent.

24. A method according to claim 7,

wherein said desorbing step is effected at the apex of said dynamic electric field.

25. A method according to claim 7,

wherein said desorbing step is effected continuously during the application of said dynamic electric field.

26. A method according to claim 21,

wherein said traveling electric wave is a substantially square wave, a substantially triangular wave, or a substantially sinusoidal wave.

27. A method according to claim 7,

wherein said dynamic electric field is produced by at least two inductors.

28. A method according to claim 7,

wherein said dynamic electric field is produced by polyphase current.

29. A method according to claim 7,

wherein said static non-homogeneous electric field is produced by at least two inductors.

30. A method according to claim 28 or 29,

wherein said inductors are electrodes.

31. A method according to claim 30,

wherein said electrodes comprise at least one conductive material.

32. A method according to claim 30,

wherein said electrodes are contacted with or at least partially coated with a high dielectric barrier.

33. A method according to claim 30,

wherein said conductive material comprises at least one metal, metal oxide, conductive ceramic material, conductive polymeric material, or an alloy or combination thereof.

34. A method according to claim 33,

wherein said metal or metal oxide is rhodium, palladium, chromium, thoriated

tungsten, barium oxide, strontium oxide, copper, silver, gold, or alloy or combination thereof.

35. A method according to claim 33,

wherein said conductive ceramic material is a ceramic composite comprising TiB_2, TiC, BN, Nb, zirconia, or a combination thereof.

36. A method according to claim 33,

wherein said conductive polymeric material is a polymeric material characterized by an interchain electron transfer, valence, conduction band populations, P-type doping, N-type doping, or a combination thereof.

37. A method according to claim 33,

wherein said conductive material is a high aspect ratio conductor.

38. A method according to claim 33,

wherein said conductive material comprises at least one high aspect ratio conductor.

39. A method according to claim 38,

wherein said high aspect ratio conductor is conductive polymeric fiber, conductive ceramic fiber, carbon nanotube, non-carbon nanotube, nanowhisker, or a combination thereof.

40. A method according to claim 39,

wherein said conductive polymeric fiber is crystalline.

41. A method according to claim 39,

wherein said conductive polymeric fiber is conductive acrylic fiber.

42. A method according to claim 39,

wherein said high aspect ratio conductor is a single-wall carbon nanotube, multi-wall nanotube, or a exohydrogenated zig-zag nanotube.

43. A method according to claim 21
wherein said dynamic electric field is produced by an alternating current.

44. A method according to claim 7,
wherein said dynamic electric field cycles.

45. A method according to claim 44,
wherein said dynamic electric field cycles at a frequency of about 60 cycles/second to about 5,000,000 cycles/second.

46. A method according to claim 45,
wherein said dynamic electric field cycles at a frequency of about 1,000 cycles/second to about 1,000,000 cycles/second.

47. A method according to claim 46,
wherein said dynamic electric field cycles at a frequency of about 2,000 cycles/second to about 50,000 cycles/second.

48. A method according to claim 47,
wherein said dynamic electric field cycles at a frequency of about 5,000 cycles/second to about 10,000 cycles/second.

49. A method according to claim 45,
wherein said dynamic electric field is turned on and off about one time/second to about 10,000 times/second,

50. A method according to claim 1,
wherein said sorbent structure comprising said at least one sorbent is in the form of a particle; and
wherein said sorbent structure optionally comprises one or more elements selected from the group consisting of a binder resin, an electro-magnetic energy receptor, heat conductive material, a catalyst, a high aspect ratio material, and combinations thereof.

51. A method according to claim 7,

wherein said sorbent structure comprises at least two opposing sorbents; and

wherein said dynamic electric field is alternately applied to said opposing sorbents to create an acoustically attenuated pneumatic resonance or an electrically reactive load.

52. A method according to 51,

wherein said acoustically attenuated pneumatic resonance causes a pressure change that aids in said sorbing step, said desorbing step, or both.

53. A method according to claim 11,

wherein said heat of sorption is collected on a heat exchange component.

54. A method according to claim 53,

wherein said heat of sorption is dissipated by convection.

55. A method according to claim 53,

wherein said heat exchange component comprises metal, alloy, metal composite, alloy composite, matrix structure, thermally conductive plastic, thermally conductive polymer, ESA-formed material, or a combination thereof.

56. A method according to claim 1,

wherein said sorbent has a thermal conductivity of greater than about 0.276 W/cm-K.

57. A method according to claim 1,

wherein said sorbent is in contact with a thermally conductive material.

58. A method according to claim 2,

wherein said adsorbent is activated carbon, graphite, activated alumina, a molecular sieve, aluminophosphate material, silicoaluminophosphate material, zeolite, faujasite, clinoptilolite, mordenite, metal-exchanged silico-aluminophosphate, uni-polar resin, bi-polar resin, aromatic cross-linked polystyrenic matrix, brominated aromatic matrix, acrylic polymer, acrylic copolymer, methacrylic

polymer, methacrylic copolymer, hydroxyalkyl acrylate, hydroxyalkyl methacrylate, adsorbent carbonaceous material, adsorbent graphitic material, carbon fiber material, nanotube, nano-material, adsorbent metal salt, alkaline earth metal metallic particles, ion exchange resin, linear polymers of glucose, polyacrylamide, or a combination thereof.

59. A method of according to claim 58,

wherein said zeolite is an ion exchanged metal zeolite, hydrophilic zeolite, hydrophobic zeolite, modified zeolites metal-ion exchanged zeolite, natural X-type zeolite, modified X-type zeolite, A-type zeolite, mordenite-type zeolite, chabazite-type zeolite, ion exchange resin, bioselective sorbent, or a combination thereof.

60. A method according to claim 1,

wherein said sorbent structure further comprises at least one support.

61. A method according to claim 60,

wherein at least a portion of said sorbent is adhered to or embedded in said support.

62. A method according to claim 60,

wherein said support is a natural clay, calcined clay, modified clay, chemically treated clay, chemically modified clay, smectite clay, kaolin clay, sub-bentonite clay, kaolin-halloysite clay, kaolin-kaolonite clay, kaolin-nacrite clay, kaolin-anauxite clay, binary matrix material, tertiary matrix material, silica-thoria, silica-alumina, silica-alumina-thoria, silica-alumina-zirconia, fibrous material, colloidal silica material, colloidal alumina material, colloidal zirconia material, colloidal mixture, surface modified amorphous silicon dioxide nanoparticles, hydrated magnesium aluminum silicate, thermoplastic polymer, thermosetting polymer, ferrous support, non-ferrous support, electrically-conductive support, dielectric support, electromagnetic receptor, or a combination thereof.

63. A method according to claim 62,

wherein said support is applied by sintering, pyrolysis, slurrying, vapor deposition, casting, electro-spraying, electrophoretic deposition, extrusion, laser

deposition, electron beam deposition, silk screening, photo-lithography deposition, electrostatic self-assembly, high aspect ratio micromachining, LIGA-formation, atomic layer deposition, casting, stamping, or a combination thereof.

64. A method according to claim 60,

wherein said support is a series of micro-channels, laminar, a porous electrode; a series of concentric layers, or a combination thereof.

65. A method according to claim 1,

wherein said sorbent structure is a microporous structure in one direction.

66. A method according to claim 65,

wherein said sorbent structure is macroporous structure in a direction different than the direction of the microporous structure.

67. A method according to claim 66,

wherein said sorbent has a particle size such that the pressure differential between the microporous direction and macroporous direction is less than about 10 Pascals at a sorption cycle time of greater than about one millisecond at standard temperature and pressure.

68. A method according to claim 66,

wherein said desorbed first component moves in said microporous structure and said mixture moves in said macroporous structure.

69. A method according to claim 1,

wherein said sorbent structure further comprises at least one high aspect ratio conductor.

70. A method according to claim 1,

wherein said sorbent structure utilizes surface effects to stimulate said sorbing step, said desorbing step, or a combination thereof.

71. A method according to claim 70,

wherein said sorbent structure utilizes acoustic phonon interaction with a crystal lattice to stimulate said desorbing step.

72. A method according to claim 69,

wherein said high aspect ratio conductor is a conductive polymeric fiber, conductive ceramic fiber, carbon nanotube, noncarbon nanotube, nanowhisker, or a combination thereof.

73. A method according to claim 72,

wherein said conductive polymeric fiber is crystalline.

74. A method according to claim 72,

wherein said conductive polymeric fiber is a conductive acrylic fiber.

75. A method according to claim 72,

wherein said high aspect ratio conductor is a single-wall carbon nanotube, multi-wall carbon nanotube, or a exohydrogenated zig-zag nanotube.

76. A method according to claim 1,

wherein said sorbent structure further comprises at least one piezoelectric material or ferroelectric material.

77. A method according to claim 76,

wherein said piezoelectric material or ferroelectric material is a fiber, a particle, a nanoparticles, or a combination thereof.

78. A method according to claim 77,

wherein said piezoelectric material or ferroelectric material is lead-zirconate-titanate, barium titanate, lead zirconate, lead titanate, Rochelle salt, quartz, polyvinylidene fluoride homopolymer, polyvinylidene fluoride copolymer, polyparaxylene, poly-bischloromethyloxetane, aromatic polyamide, polysulfone, polyvinyl fluoride, synthetic polypeptide, cyanoethyl cellulose, or a combination thereof.

79. A method according to claim 1,

wherein said sorbent structure further comprises a receiver or reflector of electromagnetic energy.

80. A method according to claim 79,

wherein said receiver or reflector of electromagnetic energy converts said electromagnetic energy to heat or vibrational energy and transfers said heat or vibrational energy to said sorbent.

81. A method according to claim 79,

wherein said receiver or reflector of electromagnetic energy converts said electromagnetic energy to fluorescent or luminescent radiation and transfers said fluorescent or luminescent radiation to said sorbent.

82. A method according to claim 1,

wherein said sorbent structure comprises at least two different sorbents;

wherein each of said sorbents is selective for a different component of said mixture.

83. A method according to claim 82,

wherein said electrokinetically biasing moves each of said desorbed components in a direction different than the direction of the vector of said fluid mixture and each of said other components.

84. A method according to claim 83,

wherein each of said sorbed components are simultaneously desorbed.

85. A method according to claim 83,

wherein each of said sorbed components are sequentially desorbed.

86. A method according to claim 1,

wherein said mixture comprises air.

87. A method according to claim 86,

wherein said first component is water.

88. A method according to claim 86,

wherein said first component is oxygen.

89. A method according to claim 86,

wherein said first component is nitrogen.

90. A method according to claim 86,

wherein said first component is argon.

91. A method according to claim 86,

wherein said first component is carbon dioxide.

92. A method according to claim 86,

wherein said first component is a volatile organic compound.

93. A method according to claim 92,

wherein said volatile organic compound is an aromatic hydrocarbon, alkane, cycloalkane, halogenated hydrocarbon, alcohol, ester, aldehyde, ketone, ether, glycol ether, amide, phenol, or a mixture thereof.

94. A method according to claim 86,

wherein said first component is an indoor air pollutant.

95. A method according to claim 94,

wherein said indoor air pollutant is formaldehyde, ammonia, carbon dioxide, or a mixture thereof.

96. A method according to claim 86,

wherein said first component is an airborne biological toxin selected from the group consisting of a virus, a bacterium, a fungus, a mycotoxin (T2), a satratoxin (H), a trichothecene mycotoxin, an aflatoxin, ricin, and combinations thereof.

97. A method according to claim 86,
wherein said first component is a radioactive material.

98. A method according to claim 97,
wherein said radioactive material is radon, thoron, actinon, krypton, deuterium, tritium, carbon-11, nitrogen-13, fluorine-18, iodine-123, iodine-125, technetium-99m, technetium-95, indium-111, copper-62, copper-64, gallium-67, gallium-68, xenon, mercury, strontium-90, cesium-137, or a combination thereof.

99. A method according to claim 1,
wherein said mixture is semiconductor fabrication process exhaust.

100. A method according to claim 1,
wherein said mixture is combustion exhaust.

101. A method according to claim 100,
wherein said mixture is vehicle exhaust.

102. A method according to claim 100,
wherein said mixture is boiler exhaust.

103. A method according to claim 100,
wherein said first component or second component is carbon monoxide.

104. A method according to claim 100,
wherein said first component or second component is at least one oxide of nitrogen.

105. A method according to claim 100,
wherein said first component or second component is sulfur dioxide.

106 A method according to claim 100,
wherein said first component or second component is ozone.

107. A method according to claim 1,
wherein said mixture is an aqueous mixture.

108. A method according to claim 107,
wherein said first component or second component is a volatile organic compound.

109. A method according to claim 108,
wherein said volatile organic compound is an aromatic hydrocarbon, alkane, cycloalkane, halogenated hydrocarbon, alcohol, ester, aldehyde, ketone, ether, glycol ether, amide, phenol, or a mixture thereof.

110. A method according to claim 107,
wherein said first component or second component is a water-borne biological toxin selected from the group consisting of a virus, a bacterium, a fungus, a mycotoxin (T2), a satratoxin (H), a trichothecene mycotoxin, an aflatoxin, ricin, and combinations thereof.

111. A method according to claim 107,
wherein said first component or second component is a radioactive material.

112. A method according to claim 111,
wherein said radioactive material is radon, thoron, actinon, krypton, deuterium, tritium, carbon-11, nitrogen-13, fluorine-18, iodine-123, iodine-125, technetium-99m, technetium-95, indium-111, copper-62, copper-64, gallium-67, gallium-68, xenon, mercury, strontium-90, cesium-137, or a combination thereof.

113. A method according to claim 107,
wherein said first component or second component is a heavy metal.

114. A method according to claim 113,
wherein said heavy metal is mercury, chromium, cadmium, arsenic, lead, copper, uranium, plutonium, thorium, aluminum, zinc, silver, cobalt, or a combination thereof.

115. A method according to claim 107,

wherein said first component or second component is a water-soluble salt.

116. A method according to claim 115,

wherein said water-soluble salt is sodium salt, potassium salt, calcium salt, magnesium salt, barium salt, strontium salt, arsenic salt, nitrate, nitride, iron hydroxide, or a combination thereof.

117. A method according to claim 116,

wherein said water-soluble salt is sodium chloride; and

said sorbent is at least one ion exchange resin.

118. A method according to claim 1,

wherein said first component or second component is vaporized catalyst.

119. A method according to claim 118,

wherein said vaporized catalyst is a sulphonic acid of an aromatic hydrocarbon selected from the group consisting of benzene, toluene, xylene, and cumene.

120. A method according to claim 1,

wherein said first component or second component is glycol.

121. A method according to claim 1,

wherein said mixture comprises air, natural gas, liquid propane, inert gas, organic solvent, unsaturated hydrocarbon gas, or a combination thereof; and

wherein said first component or second component is water.

122. A method according to claim 1,

wherein said mixture is natural gas.

123. A method according to claim 122,

wherein said first component or second component is methane, water, carbon

dioxide, nitrogen, hydrogen sulfide, or a mercaptan.

124. A method according to claim 1,

wherein said mixture comprises at least one of a *linear* alkane, a branched alkane, or a cyclic alkane.

125. A method according to claim 124,

wherein said first component or second component is a linear alkane.

126. A method according to claim 1,

wherein said mixture is landfill emissions.

127. A method according to claim 126,

wherein said first component or second component is methane.

128. A method according to claim 126,

wherein said first component is carbon dioxide.

129. A method according to claim 1,

wherein said mixture is a bodily fluid.

130. A method according to claim 129,

wherein said bodily fluid is blood, blood serum, urine, respired air, saliva, spinal fluid, semen, or vaginal secretions.

131. A method according to claim 129,

wherein said first component or second component is glucose, ethanol, drug, histamine, protein, polypeptide, polynucleic acid, nucleic acid, lead, biological toxin, chemical toxin.

132. A method of producing at least one reaction product, comprising the steps of:

providing a fluid mixture comprising a first component;

providing sorbent structure comprising at least one sorbent and at least one catalyst;

adsorbing said first component onto said absorbent;

catalyzing a reaction of said absorbed first component to form at least one adsorbed reaction product;

desorbing said adsorbed reaction product; and

electrokinetically biasing said desorbed reaction product in a direction other than the vector of said fluid mixture.

133. A method according to claim 132,

wherein said desorbing step and said electrokinetically biasing step occur substantially simultaneously.

134. A method according to claim 132,

wherein said desorbing step and said electrokinetically biasing step are effected by a dynamic electric field.

135. A method according to claim 132,

wherein said absorbent and said catalyst form a complex.

136. A method according to claim 132,

wherein said first component reacts with a second component to form said at least one absorbed reaction product.

137. A method according to claim 132,

wherein said reaction product is hydrogen.

138. A method according to claim 132,

wherein said first component or said second component is methane.

139. A method according to claim 132,

wherein said first component or said second component is water.

140. A method according to claim 132,

wherein said reaction product is ammonia.

141. A method according to claim 132,
wherein said first component or said second component is hydrogen.

142. A method according to claim 132,
wherein said first component or said second component is nitrogen.

143. A method according to claim 132,
wherein said reaction products are carbon dioxide and water.

144. A method according to claim 143,
wherein said first component or said second component is methane.

145. A method according to claim 143,
wherein said first component or said second component is oxygen.

146. A method according to claim 117,
wherein said first component or second component is carbon monoxide.

147. A method according to claim 132,
wherein said first component or second component is a hydrocarbon.

148. A method according to claim 147,
wherein said hydrocarbon is an aromatic compound, alkane, cycloalkane, alkene, cycloalkane, or alkyne.

149. A method according to claim 132,
wherein said first component forms said reaction product by eliminating a second component.

150. A method according to claim 163,
wherein said first component is ethanol.

151. A method according to claim 163,
wherein said second component is water.

152. A method according to claim 163,

wherein said reaction product is ethylene.

153. A method according to claim 12,

wherein said mixture comprises at least one pathogen; and

wherein said ionization kills said pathogen.

154. A method of analyzing the components of a fluid mixture, comprising the steps of:

providing a fluid mixture comprising a first component and a second component;

providing a sorbent structure comprising at least one sorbent;

sorbing said first component onto said sorbent;

desorbing said first component;

electrokinetically biasing said first component in a direction other than the vector of said fluid mixture; and

analyzing said desorbed first component.

155. A method of analyzing the components of a fluid mixture, comprising the steps of:

providing a fluid mixture comprising a first component and a second component;

providing a sorbent structure comprising at least one sorbent;

sorbing said first component onto said sorbent;

desorbing said first component;

electrokinetically biasing said first component in a direction other than the vector of said fluid mixture;

collecting an exhaust fluid stream enriched in said second component and depleted in said first component; and

analyzing said exhaust fluid stream.

156. A method of analyzing the components of a fluid mixture according to claim 154 or claim 155, further comprising the step of:

providing a carrier gas stream having a lower flow rate than the flow rate of said fluid mixture.

157. A method of analyzing the components of a fluid mixture according to claim 154 or claim 155, further comprising the step:

providing a plurality of sorption structures.

158. A method of analyzing the components of a fluid mixture according to claim 157,

wherein said plurality of sorption structures are positioned at defined and addressable locations.

159. A method of analyzing the components of a fluid mixture according to claim 154 or claim 155,

wherein said desorption step is computer controlled.

160. A method of analyzing the components of a fluid mixture according to claim 154 or claim 155,

wherein said fluid mixture comprises at least material selected from the group consisting of: pathogen, radioisotope, explosive, biological toxin, chemical toxin, and combinations thereof.

161. A method of controlling temperature, comprising the steps of:

providing a fluid comprising a first component;

providing a sorbent structure comprising at least one sorbent in a container;

sorbing said first component onto said sorbent;

desorbing said first component;

electrokinetically biasing said first component and moving said first component in a direction other than the vector of said fluid;

condensing said first component;

evaporating said condensed first component; and

re-adsorbing said evaporated first component onto said sorbent.

162. A method of controlling temperature according to claim 161,

wherein said container is closed.

163. A method of controlling temperature according to claim 161,

wherein said fluid is Freon, chlorodifluoromethane, fully halogenated chlorofluorocarbon, partially halogenated chlorofluorocarbon, water, hydrocarbon, nitrogen, ammonia, or combination thereof.

164. A method of controlling temperature according to claim 161, further comprising the step of:

applying an electromotive force to said condensed first component.

165. A sorption device, comprising:

a sorbent structure comprising at least one sorbent;

an electrokinetic biaser; and

a desorber.

166. A sorption device according to claim 165,

wherein said electrokinetic biaser and said desorber comprise the same component(s).

167. A sorption device according to claim 165,

wherein said sorbent is an adsorbent.

168. A sorption device according to claim 165,

wherein said sorbent is an absorbent.

169. A sorption device according to claim 165,

wherein said adsorption device is solid state.

170. A sorption device according to claim 165,

wherein the mass of said adsorption device is less than about 25 kg.

171. A sorption device according to claim 165,

wherein said sorbent structure further comprises at least one catalyst.

172. A sorption device according to claim 165,

wherein said sorbent structure further comprising at least one support.

173. A sorption device according to claim 165,

wherein said sorbent structure further comprising at least one electromagnetic receptor particle in contact with or adjacent to said sorbent.

174. A sorption device according to claim 173,

wherein said sorbent is in the form of sorbent nanoparticles; and

wherein at least a portion of said electromagnetic receptor particle is coated with said sorbent nanoparticles.

175. A sorption device according to claim 173,

wherein said sorption structure comprises a plurality of electromagnetic receptor particles;

wherein said electromagnetic receptor particles are in the form of electromagnetic receptor nanoparticles; and

wherein at least a portion of said sorbent is coated with said electromagnetic receptor nanoparticles.

176. A sorption device according to claim 175,

wherein said electromagnetic receptor particle transmits at least a portion of its energy to said sorbent at an interface between said electromagnetic receptor particle and said sorbent.

177. A sorption device according to claim 173,

wherein said electromagnetic receptor particle has a ratio of volume to surface area (defined by number of atoms) of less than about 100:1.

178. A sorption device according to claim 177,

wherein said electromagnetic receptor particle has a ratio of volume to surface area (defined by number of atoms) of less than about 10:1.

179. A sorption device according to claim 165, further comprising:

a source of a fluid mixture comprising at least a first component.

180. A sorption device according to claim 165, further comprising:
a source of a fluid mixture comprising at least a first component and a second component.

181. A sorption device according to claim 179 or claim 180, further comprising:
a collector of said first component.

182. A sorption device according to claim 181, further comprising:
a collector of an exhaust fluid stream enriched in said second component and depleted in said first component.

183. A sorption device according to claim 181, further comprising:
a collector of said reaction product component.

184. A sorption device according to claim 165, further comprising:
a collector of an exhaust fluid stream depleted in said first component

185. A sorption device according to claim 179 or claim 180,
wherein said sorbent structure has a cross-sectional area; and
wherein said cross-sectional area of said sorbent structure decreases along its length.

186. A sorption device according to claim 165, further comprising:
a heat exchange medium.

187. A sorption device according to claim 186,
wherein said heat exchange medium is heat rejecting.

188. A sorption device according to claim 186,
wherein said heat exchange medium comprises at least one linearly-formed surface fins, grooves, or a combination thereof.

189. A sorption device according to claim 186, further comprising:
a source to apply an electrohydrodynamic force to said heat exchange medium to increase liquid-to-liquid contact.

190. A sorption device according to claim 186,
wherein said heat exchange medium is heat dissipating.

191. A sorption device according to claim 165, further comprising:
at least one electrohydrodynamic pump.

192. A sorption device according to claim 191,
wherein said electrohydrodynamic pump comprises porous dielectric material.

193. A sorption device according to claim 192,
wherein said porous dielectric material is silicon dioxide, silicon nitride barium titanate, or a mixture thereof.

194. A sorption device according to claim 165,
wherein said sorption device is a closed to the outside atmosphere.

195. A sorption device according to claim 165,
wherein said sorption device is open to the outside atmosphere.

196. A sorption device according to claim 165, further comprising:
one or more channels through which said fluid mixture flows.

197. A sorption device according to claim 165, further comprising:
a plurality of channels through which said fluid mixture flows.

198. A sorption device according to claim 197,

wherein said channels further comprise said sorbent structure.

199. A sorption device according to claim 197,

wherein said source of said fluid mixture is substantially perpendicular to the plane of said channels.

200. A sorption device according to claim 196,

wherein channels have sorbent adhered thereto.

201. A sorption device according to claim 165,

wherein said electrokinetic biaser produces a dynamic electric field, static non-homogeneous electric field, quasi-static electric field, electromagnetic energy, vibrational energy from a piezoelectric material, electrical conduction, ion bombardment, electron bombardment, or a combination thereof.

202. A sorption device according to claim 201,

wherein said dynamic electric field is a traveling electric field, a traveling electric wave, an electric field flux, a voltage spike, a multiphase electromotive potential, traveling electrostatic wave, or a combination thereof.

203. A sorption device according to claim 202,

wherein said dynamic electric field is continuous.

204. A sorption device according to claim 202,

wherein said dynamic electric field is intermittent.

205. A sorption device according to claim 165,

wherein said an electrokinetic biaser comprises at least two inductors.

206. A sorption device according to claim 205,

wherein said inductors are electrodes.

207. A sorption device according to claim 206,

wherein said electrodes comprise at least one conductive material.

208. A sorption device according to claim 206,

wherein said electrodes are contacted with or at least partially coated with a high dielectric barrier.

209. A sorption device according to claim 208,

wherein said conductive material comprises at least one metal, metal oxide, conductive ceramic material, conductive polymeric material, or an alloy or combination thereof.

210. A sorption device according to claim 209,

wherein said metal or metal oxide is rhodium, palladium, chromium, thoriated tungsten, barium oxide, strontium oxide, copper, silver, gold, or alloy or combination thereof.

211. A sorption device according to claim 209,

wherein said conductive ceramic material is a ceramic composite comprising TiB_2, TiC, BN, Nb, zirconia, or a combination thereof.

212. A sorption device according to claim 209,

wherein said conductive polymeric material is a polymeric material characterized by an interchain electron transfer, valence, conduction band populations, P-type doping, N-type doping, or a combination thereof.

213. A sorption device according to claim 206,

wherein said electrodes comprise a high aspect ratio conductor.

214. A sorption device according to claim 165,

wherein said sorbent structure further comprises at least one high aspect ratio conductor.

215. A sorption device according to claim 210,

wherein said sorbent structure comprises a plurality of high aspect ratio conductors.

216. A sorption device according to claim 215,

wherein at least a portion of said high aspect ratio conductors protrude from said sorbent structure.

217. A sorption device according to claim 215,

wherein said high aspect ratio conductors form an array.

218. A sorption device according to claim 215,

wherein said high aspect ratio conductor is conductive polymeric fiber, conductive ceramic fiber, carbon nanotube, or a combination thereof.

219. A sorption device according to claim 218,

wherein said conductive polymeric fiber is crystalline.

220. A sorption device according to claim 218,

wherein said conductive polymeric fiber is conductive acrylic fiber.

221. A sorption device according to claim 218,

wherein said high aspect ratio conductor is a single-wall carbon nanotube, multi-wall carbon nanotube, or a exohydrogenated zig-zag nanotube.

222. A sorption device according to claim 165,

wherein said sorbent structure further comprises at least one piezoelectric material or ferroelectric material.

223. A sorption device according to claim 222,
wherein said piezoelectric material or ferroelectric material is a fiber, a particle, a nanoparticles, or a combination thereof.

224. A sorption device according to claim 223,
wherein said piezoelectric material or ferroelectric material is lead-zirconate-titanate, barium titanate, lead zirconate, lead titanate, Rochelle salt, quartz, polyvinylidene fluoride homopolymer, polyvinylidene fluoride copolymer, polyparaxylene, poly-bischloromethyloxetane, aromatic polyamide, polysulfone, polyvinyl fluoride, synthetic polypeptide, cyanoethyl cellulose, or a combination thereof.

225. A sorption device according to claim 165, further comprising:
at least one piezoelectric valve or pump.

226. A sorption device according to claim 202,
wherein said dynamic electric field cycles.

227. A sorption device according to claim 226,
wherein said dynamic electric field cycles at a frequency of about 60 cycles/second to about 5,000,000 cycles/second.

228. A sorption device according to claim 227,
wherein said dynamic electric field cycles at a frequency of about 1,000 cycles/second to about 1,000,000 cycles/second.

229. A sorption device according to claim 228,
wherein said dynamic electric field cycles at a frequency of about 2,000 cycles/second to about 50,000 cycles/second.

230. A sorption device according to claim 229,

wherein said dynamic electric field cycles at a frequency of about 5,000 cycles/second to about 10,000 cycles/second.

231. A sorption device according to claim 165,

wherein said sorbent is activated carbon, graphite, activated alumina, a molecular sieve, aluminophosphate material, silicoaluminophosphate material, zeolite, faujasite, clinoptilolite, mordenite, metal-exchanged silico-aluminophosphate, uni-polar resin, bi-polar resin, aromatic cross-linked polystyrenic matrix, brominated aromatic matrix, acrylic polymer, acrylic copolymer, methacrylic polymer, methacrylic copolymer, hydroxyalkyl acrylate, hydroxyalkyl methacrylate, adsorbent carbonaceous material, adsorbent graphitic material, carbon fiber material, nanotube, nano-material, adsorbent metal salt, alkaline earth metal metallic particles, ion exchange resin, linear polymers of glucose, polyacrylamide, or a combination thereof.

232. A sorption device according to claim 231,

wherein said zeolite is an ion exchanged metal zeolite, hydrophilic zeolite, hydrophobic zeolite, modified zeolites metal-ion exchanged zeolite, natural X-type zeolite, modified X-type zeolite, A-type zeolite, mordenite-type zeolite, chabazite-type zeolite, ion exchange resin, bioselective sorbent, or a combination thereof.

233. A sorption device according to claim 165,

wherein said sorbent structure further comprises at least one support.

234. A sorption device according to claim 233,

wherein said support is a natural clay, calcined clay, modified clay, chemically treated clay, chemically modified clay, smectite clay, kaolin clay, sub-bentonite clay, kaolin-halloysite clay, kaolin-kaolonite clay, kaolin-nacrite clay, kaolin-anauxite clay, binary matrix material, tertiary matrix material, silica-thoria, silica-alumina, silica-alumina-thoria, silica-alumina-zirconia, fibrous material, colloidal silica material, colloidal alumina material,

colloidal zirconia material, colloidal mixture, surface modified amorphous silicon dioxide nanoparticles, hydrated magnesium aluminum silicate, thermoplastic polymer, thermosetting polymer, ferrous support, non-ferrous support, electrically-conductive support, dielectric support, electromagnetic receptor, or a combination thereof.

235. A sorption device according to claim 233,

wherein said support is applied by sintering, pyrolysis, slurrying, vapor deposition, casting, electro-spraying, electrophoretic deposition, extrusion, laser deposition, electron beam deposition, silk screening, photo-lithography deposition, electrostatic self-assembly, high aspect ratio micromachining, LIGA-formation, atomic layer deposition, casting, stamping, or a combination thereof.

236. A sorption device according to claim 233,

wherein said support is a series of micro-channels, laminar, a porous electrode; a series of concentric layers, or a combination thereof.

237. A sorption device according to claim 165,

wherein said sorbent structure is a microporous structure in one direction.

238. A sorption device according to claim 237,

wherein said sorbent structure is macroporous structure in a direction different than the direction of the microporous structure.

239. A sorption device according to claim 165,

wherein said sorbent structure comprising said at least one sorbent is in the form of a particle; and

wherein said sorbent structure optionally comprises one or more elements selected from the group consisting of a binder resin, an electro-

magnetic energy receptor, heat conductive material, a catalyst, a high aspect ratio material, and combinations thereof.

240. A sorption device according to claim 165,

wherein said sorbent has a particle size such that the pressure differential between the microporous direction and macroporous direction is less than about 10 Pascals at a sorption cycle time of greater than about one millisecond at standard temperature and pressure.

241. A sorption device according to claim 165,

wherein said sorbent is a particle; and

wherein said sorbent has a particle size of less than about 3,400 nm.

242. A sorption device according to claim 165,

wherein said sorbent structure is a form of a super crystalline lattice; and

wherein a intracrystalline pore length of said super crystalline lattice is less than about 3,400 nm.

243. A sorption device according to claim 165,

wherein said sorption device has a two-dimensional or three-dimensional shape or arrangement selected from the group consisting of:

circular, square, rectangular, triangular, hexagonal, octagonal, chevron, interleaved linear, spiral, polyhedral, and geodesic.

244. A sorption device according to claim 165,

wherein said device is portable.

245. A sorption device according to claim 165, further comprising:

at least one microprocessor controller.

246. A sorption device according to claim 165, further comprising:

at least one power conditioning device.

247. A sorption device according to claim 246,

wherein said power conditioning device is a voltage changing device, a poly-phase frequency generator, a poly-phase frequency amplifier, or a combination thereof.

248. A sorption device according to claim 247,

wherein said power conditioning device is a piezoelectric transformer, a high frequency transformer, a power transistor, a complimentary metal oxide semiconductor (CMOS), an insulated gate bipolar transistor (IGBT), or a combination thereof.

249. A sorption device according to claim 165, further comprising:

at least one thermoelectric module.

250. A system, comprising:

at least one adsorption device according to claim 165.

251. A system according to claim 250,

wherein said system comprises a plurality of adsorption devices according to claim 165.

252. A system according to claim 251,

wherein at least some of said plurality of adsorption devices are connected in series.

253. A system according to claim 251,

wherein at least some of said plurality of adsorption devices are connected in parallel.

254. A system according to claim 251,

wherein at least some of said plurality of adsorption devices are located coplanar.

255. A system according to claim 251,

wherein the edges of at least some of said plurality of adsorption devices are contiguous.

256. A system according to claim 251,

wherein at least some of said plurality of adsorption devices are stacked.

257. A system according to claim 251,

wherein at least some of said plurality of adsorption devices comprise different sorbent structures.

258. A system according to claim 250, further comprising:

at least one analytical device.

259. A system according to claim 250, further comprising:

a plurality of analytical devices.

260. A system according to claim 258 or claim 259,

wherein said analytical device is a flame detector, mass spectrometer, infrared spectrometer, Raman spectrometer, ultraviolet spectrometer, visible light spectrometer, nuclear magnetic resonance spectrometer, gas chromatograph, liquid chromatograph, atomic adsorption spectrometer, potentiometer, spectrophotometer, or a combination thereof.

261. A system according to claim 260,

wherein said analytical device analyzes the identity, concentration, or identity and concentration of a pathogen, radioisotope, explosive, explosive precursor, biological toxin, chemical toxin, or a mixture thereof.

262. A system according to claim 250, further comprising:

at least one superconducting material.

263. A system according to claim 262,

wherein said superconducting material is niobiumtitanium, an oxide of yttrium, bismuth, thallium, barium, copper or lanthanide, or a combination thereof.

264. A system according to claim 250, further comprising:

at least one electronic device.

265. A system according to claim 264,

wherein said electronic device is television, monitor, radar, microprocessor, computer, infra-red array, infrared sensor, amplifier, radio receiver, laser diode, insulated gate bipolar transistor, thyratron, and motor control .

266. A system according to claim 250, further comprising:

at least one sensor for detecting the presence, level, or both presence and level of a substance in a bodily fluid.

267. A system according to claim 266,

wherein said bodily fluid is blood, blood serum, urine, respired air, saliva, spinal fluid, semen, or vaginal secretions.

268. A system according to claim 266,

wherein said substance is glucose, ethanol, drug, histamine, protein, polypeptide, polynucleic acid, nucleic acid, lead, biological toxin, chemical toxin or a combination thereof.

269. An inanimate organ for carrying out a bodily function in a patient in need thereof, comprising:

the sorption device according to claim 165;

wherein said bodily function is selected from the group consisting of:

removing toxins from blood;

removing toxins from respired air;

and combinations thereof;

270. An inanimate organ according to claim 269,

wherein said sorption device is implanted in said patient.

271. An inanimate organ according to claim 269,

wherein said sorption device is external to said patient.

272. A system according to claim 250, further comprising:

at least one radiolysis reactor.

273. A system according to claim 250, further comprising:

at least one battery.

274. A system according to claim 273,

wherein said sorption device cools said battery during recharging.

275. A vacuum pump, comprising:

a sorption device according to claim 165;

wherein said sorption device biases desorbed molecules externally to said sorption device.

276. A vacuum pump according to claim 275,

wherein said vacuum pump provides a pressure reduction.

277. A system comprising:

a vacuum pump according to claim 275; and

a device selected from the group consisting of electron microscope, mass spectrometer, sputtering device, chemical vapor deposition device, chemical oxygen iodine laser, drying device, distillation device, vapor recovery device, chemical reactor, vacuum oven, focused charged particle beam analytical system, vacuum filtration device, gel drying device, freeze drying device, centrifugal concentration, materials processing device, and particle accelerator.

278. A vacuum pump according to claim 275,

wherein said vacuum pump provides a pressure increase.

279. A system comprising:

a vacuum pump according to claim 278;

wherein said vacuum pump is located in a vehicle; and

wherein said vacuum pump provides breathing air or increases the efficiency of a combustion process, increases the efficiency of a fuel cell process, or a combination thereof.

280. A foundry cold box, comprising:

a sorption device according to claim 165.

281. A dehydration device, comprising:

a sorption device according to claim 165.

282. A deodorizing device, comprising:

a sorption device according to claim 165.

283. An oxygen purifying device, comprising:

a sorption device according to claim 165.

284. An oxygen purifying device according to claim 283,

wherein said oxygen purifying device is portable.

285. A cooling device, comprising:
a sorption device according to claim 165.

286. A cooling device according to claim 285,
wherein said cooling device is portable.

287. A heating device, comprising:
a sorption device according to claim 165.

288. A heating device according to claim 287,
wherein said heating device is portable.

289. A refrigeration device, comprising:
a sorption device according to claim 165.

290. A refrigeration device according to claim 289,
wherein said refrigeration device is portable.

291. A refrigeration device according to claim 289,
wherein said refrigeration device is capable of cooling to cryogenic conditions.

292. A refrigeration device according to claim 289, further comprising:
a collector of solar energy.

293. A heat pump device, comprising:
a sorption device according to claim 165.

294. A heat pump device according to claim 293,
wherein said heat pump device is portable.

295. A heat pump device according to claim 293,
wherein said heat pump device cools an electric conductor, semiconductor, superconductor, or high-temperature superconductor.

296. A heat pump device according to claim 293,
wherein said heat pump device operates from radiated energy of an electrical conductor, semiconductor, superconductor, or high-temperature superconductor.

297. A computer processing unit, comprising:
a sorption device according to claim 165.

298. A vehicle, comprising:
a sorption device according to claim 165.

299. A vehicle according to claim 298,
wherein said vehicle is an aerospace vehicle.

300. A vehicle according to claim 298,
wherein said vehicle is an underwater vehicle.

301. A vehicle according to claim 298,
wherein said vehicle is a land vehicle.

302. A vehicle according to claim 301,
wherein said land vehicle is powered by hybrid power, electric power, or fuel cell power.

303. A device for purifying air in the internal environment of a vehicle,
a sorption device according to claim 165.

304. A device for purifying water in the internal environment of a vehicle,
a sorption device according to claim 165.

305. A device for cooling the internal environment of a vehicle,
a sorption device according to claim 165.

306. A fuel reformer, comprising:
a sorption device according to claim 165.

307. A fuel reformer according to claim 306,
wherein said fuel reformer is a methanol reformer.

308. A fuel reformer according to claim 306, comprising:
wherein said fuel reformer is a methane reformer.

309. A fuel purification device, comprising:
a sorption device according to claim 165.

310. A combustion device, comprising:
a sorption device according to claim 165.

311. A combustion device according to claim 310,
wherein said combustion device is a furnace.

312. A combustion device according to claim 311,
wherein said furnace is a coal-burning or natural gas-burning electrical power generator.

313. A combustion device according to claim 312,
wherein said furnace is a residential or institutional furnace.

314. A fuel cell, comprising:

a sorption device according to claim 165.

315. A device for purifying exhaust of a vehicle, comprising:
a sorption device according to claim 165.

316. A device for pollution abatement, comprising:
a sorption device according to claim 165.

317. A device for temperature conditioning spaces for human habitation, comprising:
a sorption device according to claim 165.

318. A device for temperature conditioning spaces for animal habitation, comprising:
a sorption device according to claim 165.

319. A device for temperature conditioning spaces for food storage, comprising:

a sorption device according to claim 165.

320. A concentrator for an analytical device, comprising:
a sorption device according to claim 165.

321. An analytical device, comprising:
a sorption device according to claim 165.

322. An analytical device according to claim 321,
wherein said analytical device is a flame detector, mass spectrometer, infrared spectrometer, Raman spectrometer, ultraviolet spectrometer, visible light spectrometer, nuclear magnetic resonance spectrometer, gas chromatograph, liquid chromatograph, atomic adsorption spectrometer, potentiometer, spectrophotometer, or a combination thereof.

323. An oxygen source for coal conversion, comprising:
a sorption device according to claim 165.

324. An oxygen source for a power generation system, comprising:
a sorption device according to claim 165.

325. An oxygen source for a residential or institutional furnace, comprising:
a sorption device according to claim 165.

326. An oxygen source for a fuel cell, comprising:
a sorption device according to claim 165.

327. A cryocooling device, comprising:
a sorption device according to claim 165; and
a thermoelectric module coupled to said sorption device.

328. A temperature conditioning device, comprising:
a sorption device according to claim 165;
wherein said sorption device is a closed adsorption device;
wherein said sorption device further comprises a fluid; and
wherein said temperature conditioning device is portable.

329. A temperature conditioning device according to claim 328,
wherein said temperature conditioning device provides cooling.

330. A temperature conditioning device according to claim 328,
wherein said temperature conditioning device provides heat.

331. A temperature conditioning device according to claim 328,
wherein said temperature conditioning device forms a thermal barrier having a controllable conductivity.

332. A temperature conditioning device according to claim 328,
wherein said temperature conditioning device may convert interchangeably between a thermal barrier and a bidirectional heat pump.

333. A temperature conditioning device according to claim 328,
wherein said temperature conditioning device is a thermal barrier in a missile system, aerospace vehicle, electronics enclosure, or a combination thereof.

334. An article of clothing, comprising:
a temperature conditioning device according to claim 328.

335. An article of clothing according to claim 334,
wherein said article is military protective clothing or civilian protective clothing.

336. An article of clothing according to claim 335,

wherein said article is a helmet, gloves, face mask, personal body armor, fire-resistant clothing, or a suit to protect against exposure to temperature extremes, a hazardous chemical agent, hazardous biological agent, radioactive material, or a combination thereof.

337. A thermal management device for a laser, comprising:

a sorption device according to claim 165.